

ABSTRACT

The present invention generally relates to the field of magnetic devices for memory cells that can serve as non-volatile memory. More specifically, the present invention describes a high speed and low power method by which a spin polarized electrical current can be used to control and switch the magnetization direction of a magnetic region in such a device. The magnetic device comprises a pinned magnetic layer with a fixed magnetization direction, a free magnetic layer with a free magnetization direction, and a read-out magnetic layer with a fixed magnetization direction. The pinned magnetic layer and the free magnetic layer are separated by a non-magnetic layer, and the free magnetic layer and the read-out magnetic layer are separated by another non-magnetic layer. The magnetization directions of the pinned and free layers generally do not point along the same axis. The non-magnetic layers minimize the magnetic interaction between the magnetic layers. A current is applied to the device to induce a torque that alters the magnetic state of the device so that it can act as a magnetic memory for writing information. The resistance, which depends on the magnetic state of the device, is measured to thereby read out the information stored in the device.